

XXVI. ON THE CLASSIFICATION OF THE POTAMONIDÆ (TELPHUSIDÆ).

By A. ALCOCK, C.I.E., F.R.S.

Since working at the Indian Potamonidæ, I have been able, thanks to the kindness of Dr. W. T. Calman, to look through the British Museum non-Indian Collection of these crabs, and this paper is an attempt at a synthesis of the family from data thus obtained. I say "an attempt," because a synthesis implies a complete analysis, and such an analysis in the case of the Potamonidæ involves an actual examination of every species that has been described. My justification for making the attempt is that the matter has an important bearing upon theories of geographical distribution.

Ortmann (Zool. Jahrb., Syst. x, 1897, p. 297) divides the Potamonidæ into four subfamilies, namely: (1) POTAMONINÆ, to include, *Potamon*, *Acanthotelphusa*, *Potamonantes*, *Geotelphusa*, *Paratelphusa* and *Erimetopus*; (2) DECKENIINÆ, for the unique genus *Deckenia*; (3) POTAMOCARCININÆ, to include *Potamocarcinus*, *Epilobocera*, *Hypolobocera* and *Kingsleya*; and (4) TRICHODACTYLINÆ, with *Trichodactylus* and *Orthostoma* as constituents.

Miss Rathbun (Nouvelles Archives du Mus. d'Hist. Nat., ser. 4, vi, 1904, pp. 245—247) divides the Potamonidæ into five subfamilies, namely: (1) POTAMONINÆ, embracing *Potamon*, *Potamonantes*, *Paratelphusa*, *Peritelphusa*, *Geotelphusa*, *Hydotelphusa* *Platytelphusa* (= *Limnotelphusa*) and *Erimetopus*; (2) PSEUDOTELPHUSINÆ, for *Pseudotelphusa*, *Potamocarcinus*, *Epilobocera* and *Rathbunia*; (3) TRICHODACTYLINÆ, for *Trichodactylus*, *Dilocarcinus* and *Valdivia*; (4) GECARCINUCINÆ, for *Gecarcinucus*; and (5) DECKENIINÆ, for *Deckenia*.

Both these systems emphasize the following points:—

(1) The isolation of the African Deckeniinæ. As I know only one of the three species (*D. imitatrix*) of the genus, I can hardly criticise this opinion further than to say that if *D. imitatrix* had come into my hands as an unknown form, I should have been inclined to regard it as a peculiarly modified *Acanthotelphusa*.

(2) The segregation of the American Trichodactylinæ. With this opinion I entirely agree. If a specimen of *Trichodactylus fluviatilis* had been brought to me as an unknown form, without any information as to its freshwater habitat, I doubt whether I should have referred it to the Potamonidæ at all.

(3) The disjunction of the American Potamocarcininæ or Pseudotelphusinæ. To this opinion I can give only a hesitating

assent. *Potamocarcinus* and its relatives seem to me to fall in with my series of *Paratelphusinæ* or *Gecarcinucinae*, though they certainly have some common peculiarities of their own.

(4) The close relation of *Potamon* and *Paratelphusa*. In my memoir of the Indian Potamonidæ I have given the reasons against this association.

In Dr. Ortmann's scheme *Acanthotelphusa* is recognised as a distinct subgenus closely related to *Erimetopus*. This is, I am sure, a natural arrangement; but nothing supports Dr. Ortmann's conjecture that *Acanthotelphusa* has any specially close relation to *Potamocarcinus*.

In Miss Rathbun's scheme *Gecarcinucus* is certainly quite out of perspective. This genus, so far from being anything extraordinary, can with difficulty be dissevered from *Paratelphusa*.

For my own part I should like to eject the *Trichodactylinae* and to see *Deckenia* subordinated to the *Potamoninae*, and *Potamocarcinus* and its relatives subordinated to the *Paratelphusinæ*, leaving only two subfamilies of *Potamonidæ*; but at the present moment I only propose to re-arrange Miss Rathbun's scheme slightly, and to re-characterize some of her subfamilies, as exhibited in the following synopsis and key:—

SYNOPSIS OF SUBFAMILIES OF POTAMONIDÆ.

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|---|---|--|------------------|
| 1 | { | Dactyli of crawling-legs not spinose:
merus of external maxillipeds
elongate, its outer border being
longer than that of the ischium
measured from the fork of the
exopodite. Mandibular palp of
three distinct joints, its terminal
joint simple. Abdomen of male
broadly triangular, the 6th segment
when separate being several times
broader than long | TRICHODACTYLINÆ. |
| | | Dactyli of crawling-legs spinose:
merus of external maxillipeds not
elongate: mandibular palp of
either two or three joints, its
terminal joint either simple or
bilobed: 6th segment of male
abdomen variable, but never more
than twice as broad as long 2 | |
| 2 | { | Efferent branchial channels pro-
duced to the edge of the front,
entrenching on and somewhat ob-
scuring the epistome, cramping the
antennæ, and so much contracting
the antennular fossæ that the an-
tennules fold almost longitudinally. | |
| | | | |

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|---|---|--|-------------------------------------|
| 2 | { | Mandibular palp of two joints, the terminal joint thickened and plumose at base, but not distinctly bilobed | DECKENININÆ. |
| | | Efferent branchial channels not thus produced | 3 |
| | { | Mandibular palp of either two or three joints, the terminal joint sometimes thickened and plumose at base, but not distinctly bilobed | POTAMONININÆ. |
| 3 | | Mandibular palp of two joints, the terminal joint deeply cut into two lobes, which embrace the incisor process of the mandible | 4 |
| | { | Abdomen of <i>adult</i> male usually broad at base and suddenly contracted at the 5th or 6th segment: the length of the sixth segment often exceeds and seldom falls short of its distal breadth: the seventh segment is almost always either elongate-triangular or tongue-shaped | GEARCINUCINÆ (PARATELPHUSINÆ). |
| 4 | | Abdomen of adult male not abruptly contracted distally: the sixth segment is usually much broader than long, and the seventh segment is broadly triangular: male abdominal appendages heavy, with blunt, lobed ends | PSEUDOTELPHUSINÆ (POTAMOCARCININÆ). |

KEY TO THE SUBFAMILIES OF POTAMONIDÆ.

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|---|--|---|
| { | Terminal joint of mandibular palp deeply cut into lobes which embrace the incisor process of the mandible between them | I |
| | Terminal joint of mandibular palp consisting of a single lobe (the base of which may be sometimes thickened and plumose) lying behind the incisor process of the mandible ¹ | 2 |

¹ In some of the *Potamoninæ* the thickening of the base of the terminal joint of the palp is considerable, and as the hairs that fringe the thickening hang in a tuft over the incisor process of the mandible, the whole has somewhat the appearance of an independent lobe; this condition is most manifest in *Potamonantes* and in some of the African species of *Geotelphusa*, but it is not difficult to distinguish it from the broad, heavy, overhanging lobe of, e.g., *Paratelfusa tridentata*, if the palp be removed and denuded.

1	{	The length of the sixth abdominal segment of the adult male seldom falls short of its minimum breadth; the seventh segment is hardly ever broadly triangular ..	GECARCINUCINÆ (Old World, except Europe).
		The length of the sixth abdominal segment of the adult male is usually much less than its minimum breadth; the seventh segment is usually broadly triangular: male appendages peculiarly heavy and blunt	
2	{	Merus of external maxillipeds elongate: dactyli of crawling-legs non-spinose	PSEUDOTELPHUSINÆ (New World).
		Merus of external maxillipeds not elongate: dactyli of crawling-legs strongly spinose	
		Efferent branchial channels produced to the edge of the front ..	
3	{	Efferent branchial channels produced to the edge of the front ..	TRICHODACTYLINÆ (New World, chiefly S. America).
		Efferent branchial channels not abnormally produced	
			DECKENIINÆ (E. Africa, Seychelles).
			POTAMONINÆ (Old World).

Subfamily POTAMONINÆ.

In this subfamily the terminal joint of the mandibular palp is never deeply cleft into two lobes, though it may sometimes be thickened and plumose at base. The abdomen of the *adult* male is almost never abruptly contracted distally; its sixth segment is almost always much broader than long, and its seventh segment is almost always broadly triangular.

It is safe to say that the subfamily is restricted to the Old World, being represented in Europe, Africa, Asia (abundantly), the Malay Archipelago, and (doubtfully) in Australia. One species—*Potamon* (*Geotelphusa*) *chilense*, Heller—is said to have come from Chili; but both the generic determination and the locality require confirmation, for there is nothing either in the description or in the figure published that affords conclusive evidence of its position.

The diagnostic features and the broad geographical distribution of the constituent genera are shown in the following synopsis:—

SYNOPSIS OF GENERA AND SUBGENERA OF POTAMONINÆ.

1	{	Antero-lateral borders of carapace serrulate or crenulate, but not strongly laciniate or spinose, though there may be a single lateral epibranchial spine ..	1	
		Antero-lateral borders of carapace strongly lancinate or spinose ..	2	
		Flagellum of exopodite of external maxillipeds strong ..	3	
		Flagellum of exopodite of external maxillipeds vestigial or absent		POTAMISCUS ¹ (India and China).
3	{	Post-orbital crests and lateral epibranchial spine very distinct ..	4	
		Post-orbital crests and lateral epibranchial spine indistinct or obsolete		GEOTELPHUSA ¹ (Asia, Malay Archipelago, Africa).
4	{	Edge of front spinulose ..		HYDROTELPHUSA (Madagascar).
		Edge of front entire	5	
5	{	Epigastric and post-orbital crests not continuous		POTAMON <i>subgenus</i> (Europe, Asia, Malay Archipelago, Africa).
		The epigastric and post-orbital crests of each side form an unbroken line		POTAMONAUTES ¹ (Africa).
2	{	Upper border of merus of chelipeds without a subterminal spine		PLATYTELPHUSA (L. Tanganyika).
		Upper border of merus of chelipeds with a subterminal spine or tooth	6	
6	{	Antennal flagellum and terminal joints of antennal peduncle vestigial and hidden		PARAPOTAMON (L. Yunnan Fu).
		Antennal peduncle and flagellum normal	7	
7	{	Eyes and eyestalks normal ..		ACANTHOTELPHUSA (Asia, Africa).
		Eyestalks somewhat tapering, eyes small		ERIMETOPUS (W. Africa).

¹ Subgenus of *Potamon*.

Potamon in the above synopsis refers to the subgenus only, the type of which is *P. potamios*. The species of this subgenus, as here limited, range from S. Europe, N. and E. Africa, and Madagascar, all through S. Asia, to China and the Malay Archipelago; but the subgenus is not represented in the peninsular part of India.

Potamiscus has hitherto been found only in N. E. India and Tongchuan Fu.

Geotelphusa ranges from Japan and S. Asia to N. and E. Africa. It may occur in Australia, but the only two Australian species attributed to *Geotelphusa* which I have been able to examine belong to the Gecarcinucine group *Liotelphusa*. It does not occur in the Indian peninsula, Kingsley's *Geotelphusa enodis* being, as I have lately ascertained by examination of specimens, a *Liotelphusa*.

Hydrotelphusa is peculiar to Madagascar. It is very like *Potamon*, but the thickening at the base of the terminal joint of the mandibular palp is more than ordinary prominent, and the sixth abdominal segment of the adult male is not so broad.

Potamonautes is confined to Africa; the Indian species that have been referred to *Potamonautes* belong to other groups.

Platytelphusa (= *Limnotelphusa*, Cunninghamton) is peculiar to Lake Tanganyika.

Acanthotelphusa is well represented both in E. Africa and S. Asia. It has not been found in the peninsular part of India.

Parapotamon seems to be restricted to L. Yunnan Fu. It includes two species—*P. endymion* and *P. spinescens*. In the former the merus of the external maxillipeds is somewhat longer and narrower than usual, and the exopodite of these appendages is non-flagellate; in the latter this is not the case. *Parapotamon* is, undoubtedly, closely related to *Acanthotelphusa*, but has the post-orbital crests almost obsolete.

Erimctopus, which is also a very near relative of *Acanthotelphusa*, is restricted to West Africa.

Subfamily DECKENIINÆ.

This subfamily comprises a single genus, *Deckenia*, with three constituent species, two of which are found in E. Africa and one in the Seychelles. The Seychelles species, judging from Miss Rathbun's figure, is a good deal unlike the other two.

No doubt the prolongation of the efferent branchial canals, which encroach on the epistome and alter the set of the antennæ and antennules, gives these crabs a peculiar appearance; but it seems to me that the ends of classification would be best served by placing *Deckenia* with the *Potamoninæ*.

Subfamily GECARCINUCINÆ.

In all the members of this large subfamily the mandibular palp is divided into two lobes, a dorsal and a ventral: the dorsal

lobe is falciform and lies behind the incisor process of the mandible; the ventral lobe, which is a broad oval plate, more or less covers the exposed surface of the incisor process. Very commonly the abdomen of the adult male is broad at base and is suddenly narrowed at the 5th or 6th segment; but, whether this is so or not, the length of the 6th segment is hardly ever less than (often exceeds) its minimum breadth, and the 7th segment is elongate-triangular or tongue-shaped—not broadly triangular.

The subfamily is restricted to the Old World, and is represented in Asia, Africa, the Malay Archipelago and Australia. All the *Potamonidæ* found in peninsular India belong to this subfamily.

It has already been mentioned that in certain *Potamoninæ* the terminal joint of the mandibular palp, when casually examined, appears to be bilobed: in any case of doubt the palp should be removed and denuded, or, better still, allowed to dry.

The following table shows the diagnostic characters of the constituent genera. The geographical distribution of the several genera cannot be stated with precision, since in the descriptions of species the points most necessary for focus are often not recorded:—

SYNOPSIS OF THE GENERA AND SUBGENERA OF
GECARCINUCINÆ.

I	{	Front in adult either not wider than or less than half again as wide as the orbit	I
		Front in adult usually much wider than, but never less than one-and-two-thirds as wide as the orbit	2
I	{	Lower outer corner of orbit produced into a sort of gutter ..	GEARCINUCUS (Peninsular India).
		Orbits normal	CYLINDROTELPHUSA (Peninsular India, New Guinea).
2	{	Upper border of merus of chelipeds with a subterminal spine ¹ ..	3 ¹
		Upper border of merus of chelipeds without any subterminal spine ..	4
3	{	Post-orbital crests prominent ..	Subgenus PARATELPHUSA (Asia, Malay Archipelago, Africa).
		Post-orbital crests faint or obsolete	PERITELPHUSA (Malay Archipelago).

¹ Except in *Paratelphusa blanfordi*, a Baluchistan species with broad spooned fingers, and in a few other species which, however, can be distinguished by having the antero-lateral borders of the carapace strongly spinose.

4	{	Post-orbital crests prominent ..	5	
		Post-orbital crests low, indistinct, or obsolete	6	
5	{	Epigastric and post-orbital portions of crests either continuous or almost in line		BARYTELPHUSA ² (Asia, Malay Archipelago, Africa?).
		Epigastric portion in advance of and slightly overlapping post-orbital portion of crest ..	7	
7	{	Exopodite of external maxillipeds strongly flagellate		OZIOTELPHUSA ² (Asia, Mauritius).
		Flagellum of exopodite of external maxillipeds vestigial or absent ¹		PHRICOTELPHUSA ² (Asia).
6	{	Exopodite of external maxillipeds flagellate		LIOTELPHUSA ² (Asia, Malay Archipelago, Australia).
		Exopodite of external maxillipeds non-flagellate		GLOBITELPHUSA ² (Asia).

Subfamily PSEUDOTELPHUSINÆ.

This subfamily is restricted to the New World.

The mandibular palp is like that of the *Gecarcinucinae*: the abdomen of the adult male is like that of the typical *Potamoninae*.

Miss Rathbun bases the subfamily on the form of the merus of the external maxillipeds, which is said to be not so broad as usual and more obliquely-cut or emarginate internal to the insertion of the flagellum, and on the reduction of the exopodite of these appendages.

As regards the form of the merus, it is very variable within the limits both of the *Potamoninae* and of the *Gecarcinucinae*.

As regards the exopodite, there are *Potamoninae* in which the flagellum is absent, and there are *Gecarcinucinae* in which not only is the flagellum absent, but also the peduncle is much reduced. More than this: in the *Gecarcinucine* subgenera *Phricotelphusa* and *Globitelphusa* there are to be found exopodites of all lengths down to less than half the length of the ischium, and in *Phricotelphusa gageii* the exopodite may be flagellate or non-flagellate on one side or on both.

If the *Pseudotelphusinae* are to be separated from the *Gecarcinucinae*, which is a questionable proceeding I think, the separation must depend on the form of the abdomen of the adult male and of its appendages.

¹ In *Phricotelphusa gageii*, a Sikkim species, a slender flagellum may be present on the exopodite of one or both sides.

² Subgenus of *Paratelphusa*.

Subfamily TRICHODACTYLINÆ.

This subfamily is South American, straggling into Central America.

To me, as to Dr. Calman, its present position in the system is not altogether satisfactory.

There is no question that the members of this subfamily are very remarkably different from all other *Potamonidæ*, in many respects: the dactyli of the crawling-legs are devoid of the characteristic spines; the merus of the external maxillipeds is quite a long joint; the postero-lateral borders of the carapace are sharply defined; and in several species the middle segments of the particularly broad male abdomen are fused. Differences so numerous, and (for Cyclometope crabs) so great, appear to me to indicate a different ancestry.

